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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	09/944,506
Filing Date	August 30, 2001
First Named Inventor	Pai-Hung Pan
Group Art Unit	2823
Examiner Name	G. Fourson III
Attorney Docket Number	2269-2919.5US (96-0499.02/US)

ENCLOSURES (check all that apply)

- ☒ Postcard receipt acknowledgment (attached to the front of this transmittal)
- ☒ Duplicate copy of this transmittal sheet in the event that additional filing fees are required under 37 C.F.R. § 1.16
- ☐ Preliminary Amendment
- ☐ Response to Restriction Requirement/Election of Species Requirement dated
- ☐ Amendment in response to office action dated
- ☐ Amendment under 37 C.F.R. § 1.116 in response to final office action dated
- ☐ Additional claims fee - Check No. in the amount of \$
- ☐ Letter to Chief Draftsman and copy of FIGS. with changes made in red
- ☐ Transmittal of Formal Drawings
- ☐ Formal Drawings (sheets)

- ☐ Information Disclosure Statement, PTO/SB/08A (08-00); ☐ copy of cited references
- ☐ Supplemental Information Disclosure Statement; PTO/SB/08A (08-00); copy of cited references and Check No. in the amount of \$180.00
- ☐ Associate Power of Attorney
- ☐ Petition for Extension of Time and Check No. in the amount of \$
- ☐ Petition
- ☒ Reply Brief (11 pages); Copy of Terminal Disclaimer, Transmittal Form and check filed on January 7, 2004; Copy of date stamped postcard
- ☐ Certified Copy of Priority Document(s)
- ☐ Assignment Papers (for an Application)

- ☐ Terminal Disclaimer
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Firm or Individual name
Brick G. Power

Registration No. 38,581

Signature

Date

December 6, 2005

CERTIFICATE OF MAILING

Express Mail Label Number: EL994844881US

Date of Deposit: December 6, 2005

Person Making Deposit: Timothy Palfreyman



PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Application of:

Pai-Hung Pan

Serial No.: 09/944,506

Filed: August 30, 2001

For: SHALLOW TRENCH ISOLATION
STRUCTURE WITHOUT CORNER
EXPOSURE (as amended)

Confirmation No.: 4348

Examiner: G. Fourson III

Group Art Unit: 2823

Attorney Docket No.: 2269-2919.5US
(96-0499.02/US)

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REPLY BRIEF

Mail Stop Appeal Brief – Patents
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P.O. Box 1450
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This REPLY BRIEF is being filed in response to the Office Action of September 6, 2005.

The Examiner should note that the current rules relating to appealed final rejections allow Examiner's to raise new grounds of rejection in an Examiner's Answer, but do not permit an Examiner to reopen prosecution. *See* 37 C.F.R. § 41.39(a)(2). Since the Office Action was not characterized as an Examiner's Answer, as required by the rules, it was docketed by the

undersigned attorney as an Office Action, to which the three month shortened statutory period for response expires on December 6, 2005.

Appellants do not wish to reopen prosecution unless, for some reason, the Board of Patent Appeals and Interferences does not deem this REPLY BRIEF to have been timely filed, in which case it is requested that prosecution be reopened and that this REPLY BRIEF be considered as a timely response to the Office Action of September 6, 2005.

VIII. ARGUMENT

A. DOUBLE PATENTING REJECTION UNDER 35 U.S.C. § 101

Claim 8 has been rejected under 35 U.S.C. § 101 for allegedly reciting subject matter identical to that of claims 5-12 of U.S. Patent 6,322,634 (hereinafter “the ‘634 Patent”). This rejection has been fully addressed in the APPEAL BRIEF by pointing out the differences in scope between claim 8 of the above-referenced application and each of claims 5-12 of the ‘634 Patent.

Again, reversal of the 35 U.S.C. § 101 double patenting rejection of claim 8 is respectfully requested.

B. REJECTIONS UNDER 35 U.S.C. § 112, FIRST PARAGRAPH

Withdrawal of the 35 U.S.C. § 112, first paragraph, rejections of claims 1-6 and 18-24 is noted.

C. REJECTIONS UNDER 35 U.S.C. § 102

Claim 13 was previously rejected under 35 U.S.C. § 102(b) for being directed to subject matter that is purportedly anticipated by the subject matter described in either Morita or Mandelman. These rejections have been extended to claims 1-4, 6, 13, 18, 19, 21, 23, and 24.

1. LEGAL AUTHORITY

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference which qualifies as prior art under 35 U.S.C. § 102. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

2. REFERENCES RELIED UPON

Morita

Morita discloses several embodiments of STI structures, most of which include a central region 3 that fills a trench 2, as well as a separately formed spacer 5 that extends laterally over regions of the active surface of a semiconductor substrate 1 that are located adjacent to the trench 2. *See, e.g.*, FIGS. 6, 7, and 9. As these spacers 5 are fabricated separately from the central regions 3 of the STIs, a discernable boundary will be present between the spacers 5 and the central regions 3. In the STI embodiments that are depicted in FIGS. 6, 7, and 10 of Morita, a silicon oxide film 11 separates the spacers 5 from the active surface of the semiconductor substrate 1.

The only embodiment of an STI that includes an integral laterally extending ledge is shown in FIG. 72. More specifically, FIG. 72 of Morita shows an intermediate semiconductor device structure that includes a semiconductor substrate 1 with at least one trench 2 formed therein, silicon oxide films 11 and 36 lining the active surface of the semiconductor substrate 1 and the surfaces of the trench 2, respectively, and a silicon nitrogen film 37, which forms the STI structure, filling the at least one trench. *See also*, col. 13, lines 19-26. As FIG. 72 clearly depicts, the surface of the silicon nitrogen film 37 tapers at the edges thereof.

Mandelman

Mandelman describes (at col. 5, lines 3-23) and illustrates (in FIG. 4c) a precursor to a semiconductor device structure that includes a semiconductor substrate 10 with trenches 16 formed therein. The trenches 16 of the semiconductor substrate 10 are lined with a thermal oxide 34, as are areas of the active surface of the semiconductor substrate 10 that are located adjacent to the trenches 16. STI structures 18 fill the remaining space within the trenches, and include corner dielectrics 22c that extend laterally over regions of the active surface of the semiconductor substrate 10 that are located adjacent to the trenches 16. The STI structures 18a and their corner dielectrics 22c contact the thermal oxide 34 that lines the trenches 16 and regions of the active surface of the semiconductor substrate 10 that are adjacent to the trenches 16. The thermal oxide 34 prevents the STI structures 18a and their corner dielectrics 22c from contacting any portion of the semiconductor substrate 10.

3. ANALYSIS

a. MORITA

Claims 1-4, 6, 13, 18, 19, 21, 23, and 24 are rejected under 35 U.S.C. § 102(b) for being directed to subject matter which is allegedly anticipated by the subject matter described in Morita.

Independent claim 1 recites a structure that includes at least one shallow trench isolation structure with a substantially flat surface and an integrated ledge that contacts an area of the active surface of a substrate of the structure located adjacent to a trench within which the shallow trench isolation structure is at least partially located.

Independent claim 13 is drawn to an intermediate semiconductor device structure that includes a semiconductor substrate with at least one trench formed therein, and a trench isolation structure within the at least one trench. The trench isolation structure also extends laterally over and contacts a portion of the active surface of the semiconductor substrate adjacent to a trench corner. In addition to requiring that the ledges of an STI structure contact an active surface of a semiconductor substrate, independent claim 13 also requires that the at least one shallow trench isolation structure have a substantially flat surface.

The only embodiment of an STI structure that includes an integral laterally extending ledge disclosed in Morita is shown in FIG. 72 of that reference. More specifically, FIG. 72 of Morita shows an intermediate semiconductor device structure that includes a semiconductor substrate 1 with at least one trench 2 formed therein, silicon oxide films 11 and 36 lining the active surface of the semiconductor substrate 1 and the surfaces of the trench 2, respectively, and a silicon nitrogen film 37 filling the at least one trench. *See also*, col. 13, lines 19-26. As

FIG. 72 clearly depicts, the surface of the silicon nitrogen film 37 tapers at the edges thereof. As the surface of the silicon nitrogen film 37 of Morita has tapered edges, it is not substantially flat.

Moreover, in addition to contacting portions of the structure's substrate that are located adjacent to the trench within which the STI structure (silicon nitrogen film 37) is at least partially located, the silicon dioxide film 11 of Morita contacts more remote portions of the active surface of the substrate, in contradiction with the requirement of independent claims 1 and 13 that an STI structure only contact portions of the active surface that are located "adjacent to the at least one trench."

Moreover, it appears that the Examiner has confused the silicon dioxide film 11 of Morita, which is located under the silicon nitrogen film 37, or STI structure, with a part of the STI structure. As these "films" are formed from different materials, particularly within the ledge of the STI structure, silicon nitrogen film 37, they do not lack a discernable boundary, as required by independent claim 1.

In view of the above-mentioned shortcomings of Morita, it is respectfully submitted that, under 35 U.S.C. § 102(b), the subject matter to which each of independent claims 1 and 13 is drawn is allowable over the subject matter described in Morita.

Claims 2-4 and 6 are each allowable, among other reasons, for depending either directly or indirectly from claim 1, which is allowable.

Independent claim 18 recites a precursor to a semiconductor device structure that includes a semiconductor substrate, at least one trench formed in the semiconductor substrate, and a buffer film layer over an active surface of the semiconductor substrate. In addition, the precursor

structure of independent claim 18 includes at least one shallow trench isolation structure at least partially within the at least one trench. The at least one shallow trench isolation structure is exposed through the buffer film layer. In addition, the at least one shallow trench isolation structure includes at least one integral ledge that extends laterally outward from the at least one trench so as to contact an area of the active surface adjacent the at least one trench.

Morita includes no express or inherent description of a structure that includes a shallow trench isolation structure with a ledge that contacts an active surface of a semiconductor substrate and that is exposed through a buffer film layer located over the active surface. As Morita does not describe these elements in identical detail to that provided by independent claim 18, it is respectfully submitted that, under 35 U.S.C. § 102(b), the subject matter recited in independent claim 18 is allowable over that described in Morita.

Claims 19, 21, 23, and 24 are each allowable, among other reasons, for depending either directly or indirectly from claim 19, which is allowable.

b. MANDELMAN

Claims 1-4, 6, 13, 18, 19, 21, 23, and 24 also stand rejected under 35 U.S.C. § 102(b) for reciting subject matter which is purportedly anticipated by that described in Mandelman.

The precursor to which independent claim 1 is drawn includes a shallow trench isolation structure with an integral ledge. There is no discernable boundary between the ledge and the remainder of the shallow trench isolation structure.

In Mandelman, the STI structures 18a and their corner dielectrics 22c contact the discernably distinct thermal oxide 34 that, in turn, lines the trenches 16 and regions of the active

surface of the semiconductor substrate 10 that are adjacent to the trenches 16. The thermal oxide 34 prevents the STI structures 18a and their corner dielectrics 22c from contacting any portion of the semiconductor substrate 10. As Mandelman lacks any description that the STI structures 18a thereof are rendered indiscernible from the underlying thermal oxide 34, Mandelman does not expressly describe that the STI structures 18a thereof may include a ledge with no discernable boundary from a remainder of the trench isolation structure and that contacts an active surface of a semiconductor substrate.

Therefore, Mandelman does not anticipate each and every element of amended independent claim 1, as is required to maintain a rejection under 35 U.S.C. § 102(b). Therefore, under 35 U.S.C. § 102(b), independent claim 1 recites subject matter which is allowable over that described in Mandelman.

Each of claims 2-4 and 6 is allowable, among other reasons, for depending either directly or indirectly from claim 1, which is allowable.

Independent claim 13 is drawn to an intermediate semiconductor device structure that includes a semiconductor substrate with at least one trench formed therein, and a trench isolation structure within the at least one trench. The trench isolation structure also extends laterally over and contacts a portion of the active surface of the semiconductor substrate adjacent to a trench corner.

As Mandelman does not expressly or inherently describe an intermediate semiconductor device structure that includes a trench isolation structure that extends laterally over and contacts a portion of the active surface of a semiconductor substrate adjacent to a trench corner,

Mandelman does not anticipate each and every element of independent claim 13. It is, therefore, respectfully submitted that independent claim 13 is drawn to subject matter that, under 35 U.S.C. § 102(b), is allowable over the subject matter disclosed in Mandelman.

Independent claim 18 recites a precursor to a semiconductor device structure. The precursor includes, among other things, at least one shallow trench isolation structure that includes at least one integral ledge that lacks a discernable boundary with the remainder of the shallow trench isolation structure.

Mandelman does not expressly or inherently describe that the STI structures 18 and spacers 22 disclosed therein are integral with one another, or that there is no discernable boundary between the STI structures 18 and the spacers 22. Therefore, it is respectfully submitted that the subject matter recited in independent claim 18 is, under 35 U.S.C. § 102, allowable over the subject matter described in Mandelman.

Each of claims 19, 21, 23, and 24 is allowable, among other reasons, for depending directly or indirectly from claim 18, which is allowable.

In view of the foregoing, reversal of the 35 U.S.C. § 102(b) rejections of claims 1-4, 6, 13, 18, 19, 21, 23, and 24 is respectfully requested.

D. ADDITIONAL ISSUES RAISED BY THE EXAMINER

1. OBJECTION TO CLAIM 22

Claim 22 has been objected to for reciting “buffer film layer” instead of “trench isolation structure.” This objection is noted and appropriate correction will be made to claim 22 following a decision on the above-referenced appeal.

2. OBVIOUSNESS-TYPE DOUBLE PATENTING

Claim 7 stands rejected under the judicially created doctrine of obviousness-type double patenting for reciting subject matter that is assertedly unpatentable over the subject matter recited in claim 5 of the ‘634 Patent. The obviousness-type double patenting rejection of claim 7 is improper in view of the fact that a terminal disclaimer, disclaiming any portion of the a patent issuing from the above-referenced application that extends beyond the longest possible term of the ‘634 Patent and dated January 7, 2004, was already filed in the above-referenced application.

XI. CONCLUSION

It is respectfully submitted that:

(A) Claim 8 is allowable under 35 U.S.C. § 101 for reciting subject matter that differs in scope from the subject matter recited in claims 5-12 of the ‘634 Patent;

(B) Claims 1-6 and 18-24 are allowable under 35 U.S.C. § 112, first paragraph, for reciting subject matter that is adequately described in the specification and drawings of the above-referenced application;

(C) Claims 1-4, 6, 13, 18, 19, 21, 23, and 24 are also allowable under 35 U.S.C. § 102(b) for being directed to subject matter that is novel over the subject matter described in Morita;

(D) Claims 1-4, 6, 13, 18, 19, 21, 23, and 24 are also allowable under 35 U.S.C. § 102(b) for reciting subject matter which is patentable over that described in Mandelman; and

(E) The obviousness-type double patenting rejection of claim 7 is improper.

Accordingly, it is respectfully requested that the rejections of claims 1-4, 6, 7, 8, 13, 18, 19, 21, 23, and 24 under 35 U.S.C. § 102(b) be reversed and that each of these claims be allowed.

Respectfully submitted,



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Date: December 6, 2005
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**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING
REJECTION OVER A PRIOR PATENT**Docket Number (Optional)
2269-2919.5US (96-
0499.02/US)

In re Application of:

Application No.: 09/944,506

Filed: August 30, 2001

For: TECHNIQUE FOR FORMING SHALLOW TRENCH ISOLATION STRUCTURE WITHOUT CORNER EXPOSURE
AND RESULTING STRUCTURE

The owner*, Micron Technology, Inc. of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 to 156 and 173, as presently shortened by any terminal disclaimer, of prior Patent No. 6,322,634. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 to 156 and 173 of the prior patent, as presently shortened by any terminal disclaimer, in the event that it later: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims cancelled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

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**TRANSMITTAL
FORM**

(to be used for all correspondence after initial filing)

Application Number	09/944,506
Filing Date	August 30, 2001
First Named Inventor	Pai-Hung Pan
Group Art Unit	2823
Examiner Name	G. Fourson III
Attorney Docket Number	2269-2919.5US (96-0499.02/US)

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- ☐ Petition for Extension of Time and Check No. in the amount of \$
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Firm or Individual name Brick G. Power

Registration No. 38,581

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Date

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Invention: TECHNIQUE FOR FORMING SHALLOW TRENCH
ISOLATION STRUCTURE WITHOUT CORNER
EXPOSURE AND RESULTING STRUCTURE

Applicant(s): Pai-Hung Pan
Filing Date: August 30, 2001
Serial No.: 09/944,506
Date Sent: January 7, 2004 via first class mail
Docket No.: 2269-2919.5US
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